universität innsbruck

Automata and Logic	26W	LVA 703302 + 703303
Lecture 1		October 9, 2026

Solved exercises must be marked and solutions (as a single PDF file) uploaded in OLAT. The (strict) deadline is 7 am on October 9.

Exercises

⟨2⟩ 1. Design DFAs for the following sets.
   (a) The set of strings in $\{a, b, c\}^*$ containing the substring abc.
   (b) The set of strings $x \in \{a, b\}^*$ such that $\#a(x)$ is odd and $\#b(x)$ is a multiple of three.

⟨2⟩ 2. Let $M = (Q, \Sigma, \delta, s, F)$ be an arbitrary DFA. Prove by induction on $|y|$ that

$$\widehat{\delta}(q, xy) = \widehat{\delta}(\widehat{\delta}(q, x), y)$$

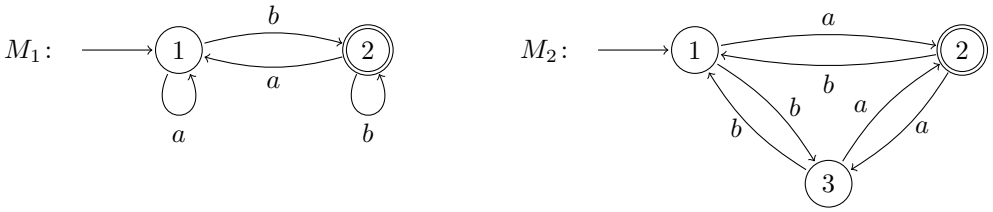
for all strings $x, y \in \Sigma^*$ and states $q \in Q$.

⟨3⟩ 3. Prove that the set $\{x \in \{0, 1, 2\}^* \mid x \text{ is a ternary representation of a multiple of four}\}$ is regular.

⟨3⟩ 4. (a) Prove that regular sets are effectively closed under set difference $(-)$ defined as:

$$A - B = \{x \mid x \in A \text{ and } x \notin B\}$$

(b) Consider the DFAs



Construct a DFA M such that $L(M) = L(M_1) - L(M_2)$.